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Report on Technical Classification of Natural Rubber in Malaya.

THE JOURNAL OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

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FOREWORD.

The Report published in this Communication was first prepared by the staff of the Chemical Division of the Rubber Research Institute for submission to members of the *ad hoc* Committee of a proposed Technical Organisation of Natural Rubber Producers, Malaya.

The proposal to set up this organisation was made at a meeting of representatives of rubber producing and marketing interests in Malaya, held at the Rubber Research Institute in September, 1949. A full account of the meeting was published under the general title "Quality and Grading of Natural Rubber" in the Journal R.R.I.M., Vol. 12, Communication 269, June, 1950.

The *ad hoc* Committee, with the approval of the principal organisations represented at the meeting of September, 1949, has submitted the following Report on Technically Classified Rubber to the Rubber Producers' Council of the Federation of Malaya.

When the original proposal to set up a joint Technical Organisation for Malayan rubber producers was made there was no single body in Malaya representing all producer interests; since that time the Rubber Producers' Council has been established and it appears to be generally agreed that the new organisation is now the appropriate body to exercise many of the functions the proposers of the Technical Organisation of Rubber Producers Malaya had in mind when advocating its formation in 1949.

This Report is published by the authority of the Board of the Rubber Research Institute of Malaya, because it records the results of investigations undertaken in Malaya by staff of the Rubber Research Institute and the British Rubber Producers' Research Association, and with the approval of the Rubber Producers' Council to whom it has been presented.

REPORT ON TECHNICAL CLASSIFICATION OF NATURAL RUBBER IN MALAYA.

Introduction.

At a meeting of representatives of the Malayan rubber producing industry held in September, 1949, at the Rubber Research Institute, it was unanimously agreed that it was desirable to set up a Technical Organisation of Rubber Producers, Malaya, whose main objective would be to promote by all means improvement in the quality of natural rubber. (*See* J.R.R.I. of M. Vol. 12, Comm. 269, June, 1950).

It was decided to refer this proposal to the several organisations and associations represented at the meeting, as delegates had not the authority to commit their principals to any formal arrangement at that stage, and meantime to set up an *ad hoc* Committee to undertake preliminary work.

The formal proposal to set up a Producers' Technical Organisation was circulated to, and generally endorsed by, the bodies represented at the meeting; but it was the opinion of the majority that the formal setting up of an organisation to implement new projects should await the results of further technical investigations.

The *ad hoc* Committee was charged to consider specific projects for immediate study and became in effect a Technical Committee. The principal projects recommended by the general meeting were:

(i) To investigate means of introducing as speedily as is practicable a system of technical grading for solid rubber and, in this connection, to consider the application to Malayan production of the system for specification of rubber proposed by the French delegation at the International Rubber Study Group meeting in London in April, 1949.

(ii) To examine means for the replacement of manufacture in small uneconomic units by a system of centralised manufacture with particular reference to the needs of smallholders.

Work on the second project, (ii) above, has been one of the principal concerns of the Smallholders' Advisory Service of the Rubber Research Institute and the Rural and Industrial Development Authority, and will not be dealt with further in this report.

On the first project intensive work has been undertaken, and it is felt that the time is ripe for a full report to the industry and that recommendations for action by the producers should be recorded.

The *ad hoc* (technical) Committee—original membership and reference to co-opted members who have served on occasions is given below—has held four formal meetings, and many less formal discussions, since its first meeting on the 13th September, 1949. Progress reports have been issued to members.

Constitution of the Ad Hoc Committee.

Representing.	Original members.	Co-opted members.
Producers' organisations	Mr. C. Thornton Mr. Khoo Teik Ee Tuan Sheikh Ahmad bin Sheikh Mustapha Mr. I. A. Sibiriakoff	Mr. J. D. Hastings
Market organisations...	Mr. F. J. Kemlo Mr. Heah Joo Seang	Mr. J. H. Forrester Mr. T. K. Holme
Technical and Research organisations	Mr. C. E. T. Mann (*Chairman*) Dr. G. Gee Dr. E. M. McColm Mr. M. W. Philpott Mr. H. Fairfield Smith	Mr. C. C. T. Sharp Dr. R. G. Newton Mr. W. G. Wren Mr. H. C. Baker Mr. R. I. Wood

Historical Note on Technical Classification of Rubber.

The history of the natural rubber industry records a number of attempts to establish, from the consumers' standpoint, a more valuable and informative means of classification than is provided by the system of visual grading in current use.

The first well-formulated proposals to this end made since artificial or synthetic rubbers became established were put forward by the French delegation to the 1949 meeting of the International Rubber Study Group in London. (An account of the proposed system will be found in a brief article entitled "Specified Rubbers" in R.R.I. Journal Vol. 12, Comm. 269, page 272, published in June, 1950.)

The French proposals were received with approval by the Rubber Study Group, and commended for close study by the representatives of producers. Malayan producers commenced without delay through their own technical organisations a series of detailed investigations on the variability of Malayan rubber with a view to classification of Malayan production on the basis of the French proposals.

At the 1950 meeting of the International Rubber Study Group in Brussels, progress in the technical classification of natural rubber was reported to the newly formed Packing and Marketing Committee of the Group. Manufacturers' representatives showed great interest in the development and offered their co-operation in evaluation of the improved methods of classification. At the same time the International Rubber Research Board was charged with the duty of co-ordinating work on technical classification, and in due course appointed Dr. R. G. Newton as co-ordinating and liaison officer for that purpose.

At the 1951 meeting of the International Rubber Study Group in Rome, it was possible to report early results of the favourable reception of Technically Classified Rubber, but it was apparent that further progress would be entirely dependent on the provision of much larger shipments of rubber so classified for large-scale factory evaluation.

Efforts during the past year have been largely directed to providing a considerable tonnage of technically classified smoked sheet of market grades R.S.S.1 and 2 from estates in order to supply the material urgently needed to establish the value of the T.C.R. system of presentation.

Briefly, the object of Technical Classification is to provide the user of natural rubber with useful information additional to that provided by the current system of visual grading, and to supply rubber in bulk reliably classified and uniform in technical properties.

At present technical classification provides valuable information on "ease of processing" and "rate of cure", two technical properties of the greatest importance to the manufacturer.

In order to avoid tedious repetition in the following account of progress of work in Malaya, the following abbreviations are used:

T.C.R. means Technically Classified Rubber of natural origin.

Variability means variation in technical properties.

Development of T.C.R. in Malaya.

(1) Progress to the end of 1951.

(*a*) Variability Surveys.

Following the setting up of the *ad hoc* (technical) Committee in September, 1949, with the immediate task of investigating the problems of technical grading of Malayan rubber, a number of surveys were undertaken by the Rubber Research Institute with the object of determining the variability of rubber prepared by:

1. Estates over 1,000 acres;
2. Large estates;
3. Miscellaneous small producers (packing house surveys);
4. Remillers.

Samples were taken in all cases and variability was assessed in accordance with the methods put forward by the French producers at the International Rubber Study Group meeting in London in April, 1949. Additional tests were carried out for the purpose of comparing alternative methods of evaluation.

These surveys, which involved the testing of over two thousand separate samples, were completed by July, 1950; the main conclusions were:

(i) Variability of smoked sheet within a particular visual grade is large and in this respect there is little to choose between high and low visual grades of smoked sheet rubber;

(ii) Variability among sheets within a bale can also be large, but many estates produce relatively uniform bales, which, however, differ markedly in technical quality from bales from other estates;

(iii) Variability within a day for a particular type of remilled rubber is greater than that for estate produced sheet, but particular remilleds from different factories within the Federation show a large measure of uniformity.

The estate surveys established that variability among the sheets within a bale could be large. The method of sheet sampling employed on estates in Indo-China, where large scale bulking facilities greatly reduce sheet to sheet differences, did not therefore appear suitable for Malayan estate production where

bulking is the exception. Moreover, since the manufacturer uses whole bales, or sections of bales cut through the sheets, variation between sheets within a bale is of little importance, and in consequence a method of obtaining a representative sample from a bale was developed.

Smaller re-surveys of estate and packing house rubber were then carried out using the bale sampling technique; the main conclusions from these surveys were:

(iv) Variability between bale samples taken on any one day from an estate is substantially less than for sheet samples taken on any one day;

(v) Variability between bales of a particular visual grade of smoked sheet normally handled by a packing house on any one day is distinctly larger than the variation between bales on any day from an estate and would seem to preclude the possibility of obtaining uniform rubber from packing houses, *except* by reorganisation of the existing methods of packing.

These main surveys confirmed the wide range of variability of the overall Malayan production of natural rubber, but indicated that a scheme of technical classification could be established without great difficulty for Malayan estate-produced R.S.S.

(*b*) Simplified Testing Technique.

In addition to the introduction of bale sampling as a modification of the original French scheme, it became evident that a much simpler test for the assessment of vulcanised properties involving equipment which would be readily available and would give reliable service without specialist attention, was essential if a large scale development of T.C.R. in Malaya was to be effected quickly. The Strain Tester developed by the British Rubber Producers' Research Association proved very satisfactory for this purpose and was employed in addition to standard test equipment for much of the survey work and for all estate classification.

(*c*) Supply of Bulk Shipments of T.C.R.

Towards the end of 1950 a small trial shipment of 6½ tons of technically classified R.S.S.1 from Malayan estates was despatched to the U.S.A. for manufacturer evaluation. It became evident, however, that much larger quantities of material would be necessary before consumer reaction could be assessed reliably, and following the internationally agreed change in the class limits for vulcanised properties which came into effect on the 1st January, 1951, major effort was concentrated on making available large quantities of technically classified R.S.S.1 from Malayan sources.

A trial Testing Station was set up within the existing Rubber Research Institute building and operated by personnel trained by and under the supervision of senior officers of the Rubber Research Institute and of the British Rubber Producers' Research Association. A total of 94 estates co-operated throughout the year and on 51 of these initial checks on level and variability were completed and class marks allocated. During 1951 it is estimated that approximately 6,000 tons of R.S.S.1 were

technically classified, of this about 3,000 tons, bearing the appropriate class-marks, were shipped. At the beginning of 1952 the 35 estates then marking bales represented an annual rate of output of approximately 11,000 tons.

(*d*) Other Investigations.

In addition to the main project for making available large quantities of classified rubber, a number of subsidiary investigations directly connected with problems of technical classification were carried out during 1951 and are listed briefly below:

1. Further surveys of remilled rubber;
2. An examination of methods for producing more uniform bales from packing houses;
3. A survey of smallholders' rubber from a selected area;
4. A study of the effect of latex bulking on the variability of rubber;
5. A study of the causes of variability in smoked sheet produced on estates;
6. An examination of some of the factors responsible for changes in the technical properties of natural rubber during storage.

A brief bibliography of publications on T.C.R. including accounts of some aspects of the above work is given at the end of this report.

(2) Further work planned for 1952.

From the point of view of overall Malayan production, the development of reasonably satisfactory classification methods for estate-produced sheet is by no means the complete answer, and inclusion of rubber from sources other than estates, as represented particularly by the output from packing houses and from remillers, is of equal importance.

Consumer reaction to the supplies of T.C.R. at present available have been very encouraging (see below), but it is also evident that a much wider response will be obtained if grades other than No. 1 R.S.S. can be brought under classification.

(*a*) Classification of Packing House Rubber.

Surveys of packing house outputs have shown that classification cannot be applied without some reorganisation of existing packing procedures, but it appears likely that a fairly simple form of "blended" bale packing may overcome many of the difficulties.

The proposed methods need large scale trials under production conditions before their suitability both from the technical and the commercial viewpoint can be assessed, and for this purpose the active co-operation of packing house interests is essential. As a result of recent contact with representatives of the rubber trade in Singapore such co-operation has been promised and the main investigation during 1952 will be an attempt to develop satisfactory classification techniques for rubber from packing houses. At the same time it is hoped to give attention to the problem of classifying remilled rubbers.

(*b*) Testing Facilities.

The Testing Station unit in the Rubber Research Institute which is at present working at about one-third full capacity on actual classification for shipment could classify and control the production of a maximum of about one hundred and fifty estates, representing an annual output of between 40,000 and 50,000 tons of R.S.S. However, the investigations required for packing house rubbers will necessarily curtail the number of estates which can be served and it is unlikely that more than one-half the Rubber Research Institute testing capacity will be available for the classification of estate production while these investigations are being carried out.

If a marked consumer demand for T.C.R. from estates develops the available test facilities may quickly become saturated, and as a period from one to two years must be allowed under existing conditions between the time of ordering equipment and the time of commencement of testing operations in a new testing unit, it appears desirable that plans should be made as soon as possible with regard to the financing, staffing and siting of new testing stations.

The experience gained from operation of the Rubber Research Institute testing unit indicates initial capital expenditure of around $65,000 and annual running costs in the region of $55,000, for a station capable of handling approximately 40,000 tons of estate produced T.C.R. per year.

These estimates are based on conditions which are probably more favourable than those possible in a station operating as an independent unit. They suggest, however, that the overall cost of technical classification is not likely to be greatly in excess of $\frac{1}{8}$ cent per pound of rubber.

(3) Consumer Reaction to T.C.R.

Although the amount of T.C.R. on which reports have been received is a small proportion of the total quantity shipped, consumer reaction has been quite favourable; this is evidenced by the increasing demands for T.C.R. which are being received from manufacturers, and a steadily increasing volume of enquiries from market organisations for supplies of T.C.R.

Some extracts from manufacturers' letters and reports are set out below:

(1) Extract from a letter from the Manager of the Compounds Division of the Dunlop Rubber Co. Ltd., Fort Dunlop, to the London Advisory Committee for Rubber Research—

> "Briefly this 50-ton consignment of technically classified rubber is appreciably less variable than the general run of supplies of R.S.S. from Malaya and the Far East. Quite definitely technically classified rubber similar to this consignment would eliminate entirely the necessity for varying the accelerator content of production compounds to aid processing."

(2) Extract from a letter from Messrs. Brown & Dureau Ltd., Adelaide, S. Australia, to Messrs. Mirandolle, Voute & Co., Singapore—

"We have been advised by our buyers in this State, that it is their intention in future to purchase, if possible, technically classified rubber. They mention that the rubbers are being classified into two properties, the Modulus at a fixed cure, and the Mooney of the Raw Rubber.

We are told that at the present time only No. 1 Ribbed Smoked Sheets are technically classified, but it is hoped that later No. 2 and No. 3 Smoked Sheets also No. 3 Remilled Crepe and No. 1 Pale Latex Crepe, will be classified in the same manner. Our buyers mention that they would like to receive details immediately of these technical classifications, and to be kept advised of any developments, adding that those suppliers who can quote technically classified rubber will undoubtedly receive preference and probably command a premium for their offers."

A letter on similar lines has been received by the Australian associates of another leading Malayan Company.

(3) Extract from a letter to Dr. R. G. Newton, International Co-ordinating Officer for the Technical Classification of Natural Rubber, from Russell F. Voelker, Esq., of the United States Department of Commerce, handling purchases of rubber for the American General Services Administration—

"Assuring you we wish to co-operate in every way possible in stimulating the shipments of T.C. rubber as we feel as you do that it is a step forward in the development of rubber usage."

(4) In connection with the programme at present in hand to prepare shipments of technically classified R.S.S. 3 from packing houses, both Messrs. Dunlop Rubber Co., Ltd., and Messrs. Goodyear Tyre & Rubber Co., Ltd., have asked for deliveries of this material for trial.

The general conclusion to be drawn from consumers' reports is that classification based on vulcanised properties is proving satisfactory, but storage changes occurring between preparation and use are giving trouble in the classification of the raw rubber. A new processability test seems desirable as a further development.

Many manufacturers, would be much more interested if larger quantities of T.C.R. were available and particularly if classification could be extended to include lower grade sheets and crepes.

Conclusions.

1. The investigations undertaken by the Rubber Research Institute in 1949-50 to examine the possibility of applying technical classification to Malayan rubber production have established that classification can be satisfactorily achieved in respect of estate-produced R.S.S. bales; at present estates co-operating with the Rubber Research Institute represent an annual

rate of output of approximately 11,000 tons. (This does not include production by commercial organisations carrying out their own classification).

2. The application of technical classification to packing house and remilling factory production requires further investigation at a factory level; active co-operation of the packing house organisations is now essential for further progress.

3. Consumer reaction to T.C.R. already exported has been generally favourable, and demands for supplies are now being received by the market.

4. The capacity of the experimental Test Station set up at the Rubber Research Institute is at present not likely to exceed 20,000 tons per annum during 1952, owing to the fact that investigational work on the classification of rubber from packing houses and remilling factories must be carried out.

5. Routine classification of rubber as a large scale commercial practice does not fall within the terms of reference of the Rubber Research Institute; it should be undertaken by rubber producing organisations. The Rubber Research Institute would continue to advise on such an undertaking.

Recommendations.

It is recommended that the rubber producing industry in Malaya should give early consideration to the setting up of an organisation to deal with technical classification of Malayan rubber.

Attention should now be given to the provision of further Test Stations, since existing testing facilities will be inadequate in the likely development of an increasing demand for T.C.R.

Rubber Research Institute,
Kuala Lumpur,
6th March, 1952.

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(2) Anon: *I.R.J.*, June 16th, 1951, *120*, 948.

(3) R. G. Newton: *I.R.J.*, August 18th, 1951, *121*, 263.

General accounts are found in the references given below. The last three cover recent work carried out in Malaya:

(4) Anon: *Rev. Gen. Caout.*, 1949, *26*, 597-600.

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